



A new species of grass mouse, genus *Akodon* (Muridae: Sigmodontinae), from Mendoza Province, Argentina

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Abstract

Examination of a collection of specimens of *Akodon* from central Argentina resulted in the recognition of a new species. This species inhabits lower elevations in Mendoza Province, Argentina, in a zone that has undergone great habitat conversion due to agricultural development. Descriptions of cranial, dental, and external morphology are presented. The new species, which is tentatively assigned to the “*varius* group” of *Akodon*, is compared with another member of the group, *Akodon molinae*, which also occurs in the region.

Key words: *Akodon*, Argentina, morphology, systematics, taxonomy

Introduction

In 1995–1996, while examining specimens in the Colección Mastozoológica, Instituto Argentino de Investigaciones de las Zonas Áridas (IADIZA-CM) in Mendoza, Argentina, J. K. BRAUN encountered a series of *Akodon* that was not assignable to any known species. Although the tags identified some of the specimens as *A. varius* Thomas, 1902, the tray holding the specimens and the box containing the skulls were labeled as *A. minoprioi*. This name was not found in any published work listing synonymies (e.g., CABRERA 1961; MUSSER and CARLETON 1993). Upon further investigation, it was noted that a series of *Akodon* from the locality where the specimens in question were collected were reported in a study published by CONTRERAS and ROSI (1980a) on the community ecology of small mammals. They identified the *Akodon* they studied as *Akodon varius neocenus* (CABRERA, 1961). Later, in 1981, CONTRERAS and ROSI presented a study at the Primeras Jornadas de Ciencias Naturales del Litoral in Santa Fe, Argentina, proposing the recognition of a new species of *Akodon* (*Akodon minoprioi*) from Mendoza Province.

The abstract of the study presented at the above meeting in 1981 offers no information regarding a morphological or karyological description of this taxon, and little information about its distribution. A more detailed systematic description was never published. It is likely that many of the specimens used in their study are the same specimens upon which our description is based. This comment is offered for those individuals who may be familiar with the name, *A. minoprioi*, which was used by CONTRERAS for a species that was not formally described (GALLIARI et al. 1996).

Herein we present a systematic study, using cranial, dental, and external morphology, of the original series of specimens and other specimens that have been collected from the region. A comparison is made with another species of *Akodon*, *A. molinae*, that is known to inhabit the general region and that is possibly closely related to the new species.

Material and methods

External, cranial, and dental measurements were recorded from 74 specimens in question and from 5 specimens of *Akodon molinae* Contreras, 1968. External measurements (in mm) recorded from the labels were: total length; length of head and body; length of tail; length of hind foot; length of ear; weight (in g).

Cranial and dental measurements were taken with dial calipers to the nearest 0.05 mm. We followed the measurements presented by MYERS (1989), with the exception of incisive angle, which was not measured, and we have added width of bullae. Measurements are: length of skull: distance from the posterior border of the supraoccipitals to the tip of the nasals; condyloincisive length: distance from the posterior margin of the occipital condyles to the anteriormost projection of the incisors; length of incisive foramina: distance between the anteriormost and posteriormost projections of the incisive foramina; length of maxillary toothrow: distance from the anterior margin of the alveolus of M1 and the posterior margin of the alveolus of M3; palatal bridge: distance from the anteriormost point on the posterior margin of the palate to the posterior margins of the incisive foramina; length of diastema: distance between the posterolateral margin of the incisive alveolus and the anteromedial margin of the alveolus of M1; zygomatic breadth: greatest distance across the zygomatic arches, perpendicular to the longitudinal axis of the cranium; interorbital breadth: least distance across the frontal bones; mastoid breadth: greatest width across the mastoids; breadth of incisive foramina: greatest distance between the labial margins of the paired incisive foramina perpendicular to the longitudinal axis of the cranium; breadth across molars: the greatest width from the labial side of one upper molar toothrow to the labial side of the other toothrow; width of zygomatic plate: width dorsal to the insertion of the zygomata on the skull, parallel to the longitudinal axis of the skull; length of nasals: greatest length of the nasal bones from the posteriormost projection of the frontal suture to the tip; breadth 1 of rostrum: greatest width of the rostrum across the nasolacrimal capsules; breadth 2 of rostrum: greatest width of the rostrum measured at the top of the arc formed by the roots of the incisors as they pass posteriorly, visible as a raised curve along the rostral walls; breadth of braincase: greatest distance across the braincase, typically on the squamosals; width of bullae: from the medial edge to the lateral edge of the ectotympanic part of the auditory bullae.

Standard names of colors (RIDGWAY 1912) were used as the reference for the descriptions. Terminology for dentition follows REIG (1977). The relative age of each specimen was based on tooth wear and the five age classes proposed by MYERS (1989) were used. Age class 1: teeth unworn; edges of M3 sharp; in many individuals M3 newly or incompletely erupted. Age class 2: slight wear on all teeth, but major cusps distinct; posteroloph on M3 still distinguishable but surface of rest of tooth flat or concave. Age class 3: moderate wear on all teeth; posteroloph on M3 obliterated. Age class 4: major cusps still distinct, but all minor lophs obliterated. Age class 5: surface of teeth entirely flat or concave.

Specimens were examined from the following museums (acronyms given in parentheses): Colección Mastozoológica, Instituto Argentino de Investigaciones de Zonas Áridas, Mendoza, Argentina (IADIZA-CM); Sam Noble Oklahoma Museum of Natural History, Norman, Oklahoma (OMNH); field numbers of specimens from Argentina in the Sam Noble Oklahoma Museum of Natural History and not yet cataloged are designated Arg. Lists of the specimens examined including locality, catalog number, sex, and type of preparation are given in the specimens examined of the species description. The following specimens (skins and skeletons) of *Akodon molinae* were examined: Argentina: Mendoza Province: 8 km W La Botija, Pampa de las Salinas, 36°14' S, 66°40' W, el. 1,400 ft., 5 (5 males, Arg 3210, 3211, 3212, 3213, 3236).

StatView (SAS Institute, Inc. 1998) was used to generate the basic statistics. Although individuals in all age classes were examined, only those in age classes 2–5 were used in data analyses.

Results

Akodon oenos, n. sp.

Holotype: Adult female; skin, skull, partial skeleton; IADIZA-CM 611; collected 31 September 1980 by M. I. Rosi.

Type locality: Argentina: Mendoza Province: Departamento La Valle, La Pega ($32^{\circ}48' \text{ S}$, $68^{\circ}40' \text{ W}$).

Distribution: Known only from central Mendoza Province, Argentina (Fig. 1). Elevation varies from about 600 to about 1200 m.

Etymology: The specific name, *oenos*, which is Greek for wine, is given because this species of *Akodon* is known only from the desert scrub habitat at middle elevations in Mendoza Province. This habitat has been extensively converted for agricultural purposes and the major crop is grapes. Mendoza is known for its wine, and thus it is likely that much of the habitat of *Akodon oenos*, the wine mouse, has been given up to produce the excellent wines of Argentina.

Diagnosis: *Akodon oenos* can be distinguished from other members of the "varius group" of *Akodon* by the following combination of characters: dorsal coloration reddish brown; ventral coloration like the dorsum but with orangish cast; eye ring absent to obsolete; white chin and/or throat absent; size medium for the group; total length $< 192 \text{ mm}$ ($\bar{x} = 169 \text{ mm}$); length of tail < 82 ($\bar{x} = 68 \text{ mm}$); ears small, $< 16 \text{ mm}$; means of measurements smaller for most characters; maxillary tooththrow relatively large for size, $< 5.05 \text{ mm}$ ($\bar{x} = 4.75 \text{ mm}$).

Description and comparison: External and cranial measurements of the holotype and other individuals are given in table 1. Features of the cranium and dentition are presented in figures 2 and 3. Comparisons made with *A. molinae* are presented in parentheses.

Akodon oenos tentatively is included in the "varius" group of *Akodon* as delineated by MYERS (1989). Clarification of the relationships with the members of this group and with other species of *Akodon* awaits further information.

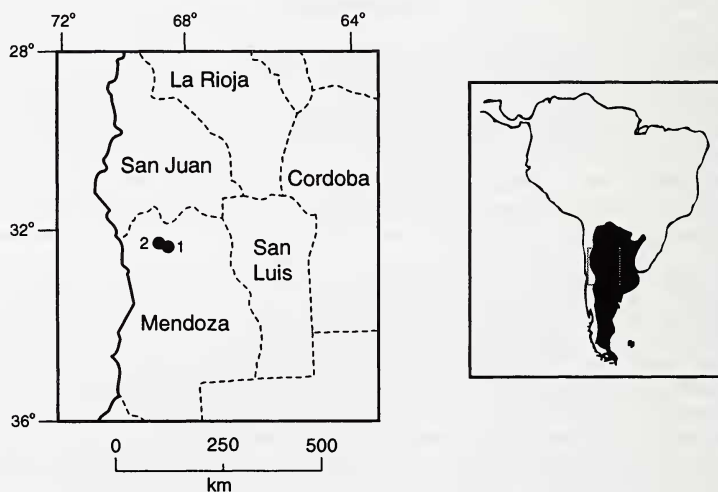


Fig. 1. Map of the provinces of west-central Argentina, including Mendoza Province. Provincial borders are shown as broken lines. The specimen localities are those presented in the text and are as follows: 1) Departamento Guaymallen, La Pega and Departamento Lavalle, La Pega; 2) Departamento Las Heras, 2 km S de Villavicencio Ruta 32.

Table 1. Measurements (in mm) and weight (in g) for *Akodon* (age classes 2–5 only). Means, standard deviations (\pm), sample sizes (), and minimum – maximum are given for each measurement.

Character	<i>Akodon oenos</i> Holotype, IADIZA- CM 611, adult female	<i>Akodon oenos</i>	<i>Akodon molinae</i>
Total length	170	169 \pm 12, (62) 140–192	168 \pm 14, (5) 151–188
Length of head and body	101	101 \pm 7, (63) 80–114	100 \pm 7, (5) 91–108
Length of tail	69	68 \pm 6, (62) 55–82	68 \pm 8, (5) 60–80
Length of hind foot	23	23 \pm 1, (62) 20–25	23 \pm 1.7, (5) 21–25
Length of ear	13.5	14 \pm 1, (62) 11–16	18 \pm 1, (5) 16–19
Weight	23.5	24.8 \pm 6.3, (63) 11.5–39.7	27.2 \pm 2.5, (5) 23.5–30.0
Length of skull	25.9	26.1 \pm 0.78, (61) 23.2–27.5	26.6 \pm 0.76, (5) 25.4–27.2
Condylolincisive length	24.4	24.5 \pm 0.85, (61) 21.2–26.3	25.0 \pm 0.88, (5) 23.7–25.8
Length of incisive foramina	5.3	5.8 \pm 0.37, (60) 4.8–6.5	5.7 \pm 0.15, (5) 5.5–5.9
Length of maxillary toothrow	4.9	4.8 \pm 0.19, (61) 4.1–5.1	4.8 \pm 0.04, (5) 4.8–4.9
Palatal bridge	3.6	3.3 \pm 0.20, (60) 2.8–3.8	4.0 \pm 0.31, (5) 3.5–4.3
Length of diastema	6.9	6.7 \pm 0.35, (61) 5.4–7.4	6.9 \pm 0.47, (5) 6.3–7.5
Zygomatic breadth		13.7 \pm 0.45, (53) 12.3–14.7	14.0 \pm 0.45, (5) 13.3–14.5
Interorbital breadth	4.6	4.6 \pm 0.15, (61) 4.3–5.2	4.7 \pm 0.16, (5) 4.6–5.0
Mastoid breadth	11.6	11.6 \pm 0.25, (61) 11.0–12.1	11.7 \pm 0.31, (5) 11.2–12.0
Breadth of incisive foramina	1.8	1.85 \pm 0.13, (58) 1.60–2.25	1.83 \pm 0.04, (5) 1.80–1.90
Breadth across molars	5.3	5.2 \pm 0.23, (61) 4.5–5.8	5.4 \pm 0.25, (5) 5.2–5.7
Width of zygomatic plate	2.5	2.8 \pm 0.20, (61) 2.4–3.2	3.1 \pm 0.19, (5) 2.9–3.4
Length of nasals	8.8	8.9 \pm 0.53, (61) 6.4–9.9	9.3 \pm 0.34, (5) 8.9–9.6
Breadth 1 of rostrum	4.7	4.7 \pm 0.18, (61) 4.1–5.1	5.0 \pm 0.33, (5) 4.6–5.3
Breadth 2 of rostrum	3.9	4.0 \pm 0.15, (61) 3.6–4.3	4.2 \pm 0.23, (5) 4.0–4.5
Breadth of braincase	12.1	11.9 \pm 0.20, (61) 11.5–12.3	12.2 \pm 0.28, (5) 11.8–12.6
Width of bullae	2.9	2.8 \pm 0.15, (61) 2.3–3.0	3.8 \pm 0.14, (5) 3.7–4.0

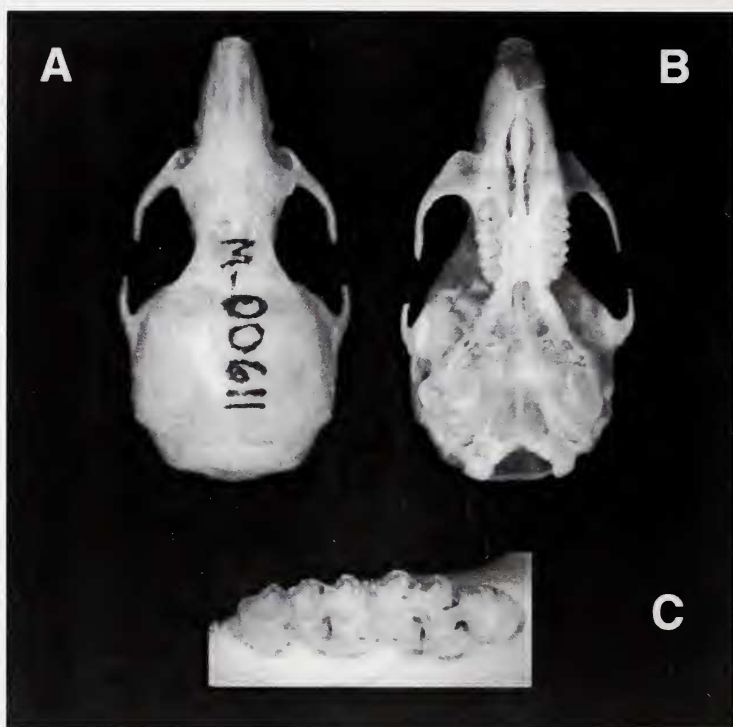


Fig. 2. Dorsal (A) and ventral (B) views of cranium, and view of upper right molar tooththrow (C) of *Akodon oenos* (IADIZA-CM 611).

Overall dorsal coloration is deep reddish brown, i.e., a mix of Snuff Brown and Saccardo's Umber (brownish gray with conspicuous gray and yellow "ticking"). Hairs average about 15 mm long on the midrump region. Hairs are white basally for about 1 mm, followed by a Blackish Mouse Gray (light gray) band of about 8 mm that is very dark for the distal 3–4 mm, a 2 mm or so band of Clay, and ending with a 1 mm dark tip. Dark guard hairs are numerous and long, projecting about 5 mm beyond the fur on the rump. The sides and the flanks are similar to the dorsum, although slightly lighter due to the decrease in the number of dark guard hairs. In the midventral region the hairs are Blackish Mouse Gray for about 75% of their length; the tips Clay or Pinkish Buff (whitish). The overall coloration of the venter has an orangish cast (whitish wash). Clay-tipped hairs (whitish) also are concentrated in the perianal region. Hairs of the throat are similar to those of the chest. The chin is without a distinctive white patch; although some whitish hairs may be present, they are not readily apparent (a white chin and sometimes a white throat are present).

The ears are small – 11–16 mm, short, and rounded (large, 16–19 mm); the inner surfaces are well furred. The hairs are grayish basally with Clay tips (tips are not Clay colored). Pre- or postauricular patches are absent. Pale hairs surround the eyes; however, the eye ring is inconspicuous (eye ring present and well developed).

The tail is moderately haired with hairs extending over 3–4 scales. It is moderately bi-colored, Fuscous or blackish brown (brownish) above and Drab below. The number of scales, measured at the base of the tail, ranges from 18 to 20 per cm. Fore- and hindfeet are covered with Drab hairs that have pale brownish bases. The hairs surround the claws but do not extend beyond the tips.

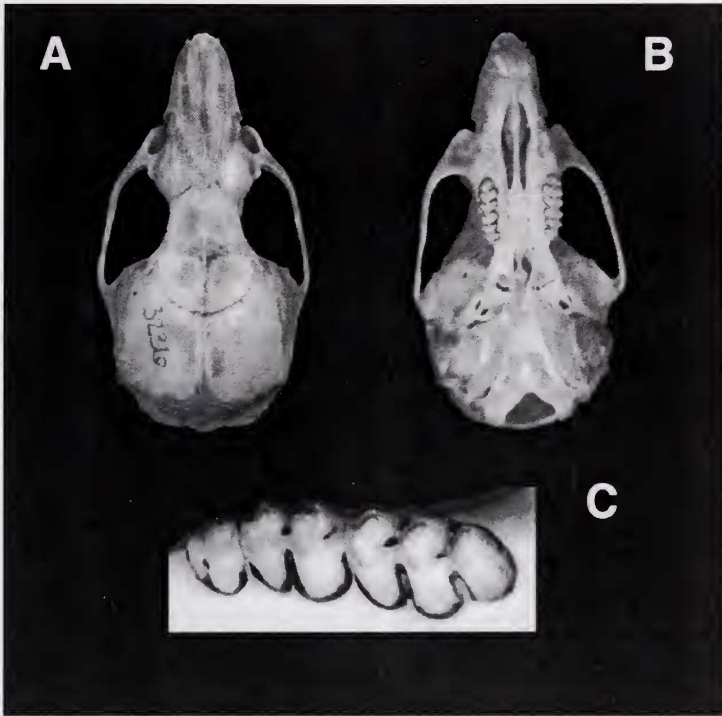


Fig. 3. Dorsal (A) and ventral (B) views of cranium, and view of upper right molar tooththrow (C) of *Akodon molinae* (Arg 3236).

The skull is similar to other species of *Akodon*. It is medium to large in size and somewhat heavily built. The gnathic process is slightly developed. The posterior ends of the nasals are blunt and extend just slightly beyond the frontopremaxillary suture. The zygomatic arches are moderately slender, slightly converging anteriorly, and only slightly expanded laterally. The zygomatic notches are moderate in width and depth (wider and deeper). Lacrimals are small. The interorbital region is narrow, rounded (hourglass shaped, although it is often slightly divergent posteriorly in individuals of older age classes); beading and ledges are absent. The frontal sinuses are not conspicuously swollen. The frontoparietal suture is a smooth crescent (generally), although in some individuals a slight angle is formed where the parietals meet at the midline. The braincase is rounded. Temporal and mastoid ridges usually are present but weakly developed. The interparietal is narrow anteroposteriorly (wider) and generally laterally expanded but not extending the breadth of the skull.

The zygomatic plate is of moderate width (wider), the anterior surface is generally flat and oriented vertically to projecting slightly forward. The rostrum, when viewed in profile, is bowed downward. An alisphenoid strut is present. The subsquamosal and postglenoid foramina are about equal in size and are separated by a strap-like hamular process.

The incisive foramina extend posteriorly to the level of the protocone of M1. The palate has grooves of shallow to moderate depth. The posterior palatal foramina are slightly enlarged and are located about even with M2. Located posteriorly and medially to the posterior palatine foramina and about even with the protocone of M3 is a second pair of foramina. Palatal bridge is short (long); mean palatal bridge is 3.32 mm (4.03 mm). The mesopterygoid fossa is simple, tending toward a lyre shape, and extends anteriorly to the posterior root of M3. A pair of posterolateral palatal pits is located to each side of the

mesopterygoid fossa posterior to the anteriormost part of the fossa. Anteriorly, the pterygoid fossa are about equal in width to the mesopterygoid fossa; the sides are rather straight, posteriorly divergent, and become wider posteriorly. The paraoccipital processes are small. The tympanic bullae are small and not inflated, mean width of bullae is 2.79 mm (Tab. 1) (bullae are larger and more inflated, mean width of bullae is 3.77 mm; Tab. 1); the eustachian tubes are short and broad. The stapedial spines are present but not well developed.

The mandible is typical for the genus. The rami are slender. Capsular projections, which generally are present as a ridge, lie below the sigmoid notches. The condyloid processes extend well beyond the coronoid process. Masseteric ridges are present but small.

The dentition is of a pattern typical for the genus. Incisors are orthodont (opisthodont). Toothrows are parallel. Molars are moderately hypsodont, but crested in young individuals. Procingulum of M1 with an anteromedian flexus that becomes less obvious to obsolete with age. The major cusps are about equal in size and are arranged somewhat diagonally in relation to each other. Parastyle, anteroloph, mesoloph, and mesostyle are present. A posteroloph is absent to obsolete. The major cusps of M2 are similar to those of M1. A cingulum (= anterolabial conule) is present as are the mesoloph and mesostyle. The M3 is small, about one-half the length of M2. When worn it appears more "C" shaped than "8" shaped and in old adults is in the form of an oval.

In m1, the cusps are about equal in size and are arranged diagonally. An anteromedian flexid, protostylid and loph, ectostylid (if present, tiny), mesostylid, mesolophid (present or absent), and posterolophid are present. Major cusps of m2 as in m1. The anterolabial conulid is present, but becomes obsolete in older individuals. The ectolophid is tiny to obsolete. The posterolophid is present, moderately developed, but is absent to obsolete in older individuals. In m3 the protoconid, metaconid, and hypoconid are present and well developed; the entoconid is present but small. Posterolophid is absent.

Habitat and ecology: The habitat of *A. oenos* includes the lower elevation halophytic desert scrub at the base of the Andean and pre-Andean ranges in central Mendoza Province (Fig. 4). It is among the most xeric parts of Mendoza Province, with rainfall of only



Fig. 4. Habitat of *Akodon oenos* from the type locality, La Pega, Mendoza Province, Argentina. Photo by R. A. OJEDA.

100 mm per year. Soils are very fine with many salts. Major plants include several species of saltbush (*Atriplex lampa*, *A. flavescens*, *A. argentina*) and the halophytic shrub *Suaeda divaricata*. Other desert shrubs such as creosote bush (*Larrea divaricata*), *Bougainvillea spinosa*, *Plectrocarpa tetracantha* and *Prosopis strombulifera* also are found in the area (CONTRERAS and ROSI 1980 a).

Other rodent species known to occur with the species at La Pega include *Calomys musculus* (Thomas, 1913), *Akodon molinae* Contreras, 1968, *Graomys griseoflavus* (Waterhouse, 1837) (not *Phyllotis darwini*, as reported by CONTRERAS and ROSI 1980 a), *Oryzomys* (= *Oligoryzomys*) *flavescens* (Waterhouse, 1837), *Mus musculus* Linnaeus, 1758, *Rattus rattus* (Linnaeus, 1758), and *Microcavia australis* (I. Geoffroy and d'Orbigny, 1833) (CONTRERAS and ROSI 1980 a, b, c). The community ecology of the small mammals of La Pega, including *A. oenos*, was studied by CONTRERAS and ROSI (1980 a). *A. oenos* was found to have a population density that was projected to be 21 animals/ha, with a biomass of 461 g/ha (although only 8 animals were captured). The home range of a single individual was less than 300 m².

At La Pega, males had abdominal testes or were subscrotal in August and September with testis size (in mm) ranging from 7×5 to 11×7. Males with scrotal testes were captured in February, October, and December, and had sizes (in mm) ranging from 12×7 to 13×9. A young male was collected in February with a testes size (in mm) of 7×4.

Females at La Pega were not reproductively active (vagina closed) in August and September (early spring). Pregnant females were captured in October and December. The number of embryos ranged from 3 to 5.

Referred specimens (74 specimens; all skin and skull, except when noted): Argentina. Mendoza Province: Departamento Guaymallen, La Pega, 51 (26 males, IADIZA-CM 10, 42, 53, 78, 79, 81, 85, 89, 513, 514, 516, 535, 543, 574, 584, 614, 653, 666, 670, 672, 677, 697, 720, 721, 723, 728; 25 females, IADIZA-CM 29, 80, 149, 380, 398, 506, 512, 519, 538, 582, 583, 597, 599, 633, 634, 637, 639, 642, 645, 655, 669, 678, 704, 722, 724). Departamento Las Heras, 2 km S de Villavicencio Ruta 32, 2 (2 males, IADIZA-CM 3447, 3448 skin). Departamento Lavalle, La Pega, 21 (11 males, IADIZA-CM 33, 47, 617, 770, 771, 772, 777, 784, 785, 787, 778; 9 females, IADIZA-CM 379, 392, 395, 396, 399, 401, 609, 611 holotype, 622; 1 sex unknown, IADIZA-CM 397).

Discussion

In the last decade we have been engaged in a systematic survey of the mammals of Argentina, especially northwestern Argentina. Argentina has long been of interest to mammalogists, and some would argue that the mammals of the country are well known. However, as our explorations have progressed, we have continued to find taxa that are new to science (both at the generic and specific level; e.g., BRAUN and MARES 1995; MARES and BRAUN 1996). In northwestern Argentina, especially, we have found that the geographic pattern of isolated mountain ranges, enclosed basins, and isolated rivers are ideal habitats for discovering new taxa. Nevertheless, we are regularly surprised by the appearance of new taxa in lowland areas, or in habitats near major metropolitan centers.

Mendoza Province is situated in westernmost Argentina in the central part of the country. It is one of the major agricultural regions in the country, and its principal product is wine. Recent studies in Mendoza have resulted in the rediscovery of populations of the rare and unusual octodontid, *Tympanoctomys barrerae* (Lawrence, 1941), (OJEDA et al. 1989, 1996; TORRES-MURA et al. 1989; MARES et al. 1997), and new species of mammals (e.g., *Ctenomys validus* Contreras, Roig, and Suzarte, 1977, CONTRERAS et al. 1977; *Abrocoma* n. sp., J. K. BRAUN and M. A. MARES pers. comm.).

Akodon oenos occurs in disturbed areas that are surrounded by agricultural zones. In addition to supporting cultivated fields, the habitats also are heavily grazed by cattle. Collectors doing survey research often neglect these areas, expecting only to find the “weedy” species that frequent such habitats over a broad region (e.g., *Oligoryzomys longicaudatus* (Bennett, 1832), *Calomys musculus* (Thomas, 1913), *Graomys griseoflavus* (Waterhouse, 1837). Yet our research has shown that undescribed species frequently can exist in areas that one would expect to have been well studied by scientists, or that might appear too affected by humans and their livestock to harbor unknown species. While it is true that we have discovered many new species in remote regions, it is also true that several new species have been found within very short distances of cities (e.g., *Akodon aliantulus* Díaz, Barquez, Braun, and Mares, 1999; Díaz et al. 1999, discovered within 20 km of the City of Tucumán). *A. oenos* is known only from a very limited area near the type locality, but the halophytic desert scrub habitat with sandy soils is continuing to be reduced as agricultural and grazing lands expand. The status of the species is unknown.

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Zusammenfassung

Eine neue Art der Grasmaus, Gattung Akodon (Muridae: Sigmodontinae) aus der Provinz Mendoza, Argentinien

Systematische Untersuchungen einer Sammlung von *Akodon* Exemplaren aus Mittel-Argentinien führte zur Entdeckung einer neuen Art. Diese Art bewohnt die unteren Höhenlagen in der Mendoza Provinz in Argentinien, eine Region die auf Grund von landwirtschaftlicher Erschließung große Lebensraumveränderungen erfahren hat. Schädel-, Zahn- und äußere Morphologie werden in Beschreibungen dargestellt. *Akodon oenos* n. sp., welche provisorisch der “*varius*-Gruppe” zugeordnet ist, wird mit *Akodon molinae*, einer anderen Art der Gruppe, die in der selben Region vorkommt, verglichen.

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